USE OF TABLEAU FOR EMP AND AEMR **REPORTING AND** DATA SHARING

APRIL 26, 2022 SCIENCE WORK GROUP MEETING



SARAH KIDD, PHD (HER) IAN EDGAR (HIM) SNEHA RAO (HER)





occured between 2012-2022. For this data QAQC please locate your projects and make sure they look like they are in the right spots. You can also mouse over the site and see the other project metadata we have on file. Please check these details and let us know





OUTLINE OF TALK

- What are EMP and AEMR and Why Do they Require Data Management?
- Background Behind Tableau
- Overview of Tableau as a Data management Platform
- Utility for Data Analysis and Collaboration
 - Examples Dashboards we are developing
 - Next Steps



WHERE IS ALL THESE DATA COMING FROM? COLUMBIA ESTUARY ECOSYSTEM RESTORATION PROGRAM (CEERP)

- Ecosystem Monitoring Program (EMP)
 - Status and trends monitoring of ecosystem condition
 - Provides basic understanding, fills knowledge gaps on estuarine - tidal freshwater section of lower river
 - Provides suite of reference sites for AEM
- Action Effectiveness Monitoring & Research Program (AEMR)
 - Allows evaluation of whether restoration actions achieved the goals of the project
 - Provides understanding of benefits of restoration actions
 - Depends on EMP for evaluation of results



Ecosystem Monitoring Program

- SALMONID HABITAT MONITORING PROGRAMS
- EMP = Ecosystem Monitoring Program 6 Trends site Reference Condition Methods here
- ✓ Mainstem and Abiotic Site Conditions Joe Needoba (OHSU)
- ✓ Habitat Structure, Hydrology, Soils, Sediment Accretion, Detritus Sarah Kidd, Sneha Rao, Ian Edgar (LCEP)
- Food Web, e.g., Planktonic and Macrophyte contributions to Juvenile Salmon Food Web Tawnya Peterson (OHSU)
- ✓ Fish Prey and Macroinvertebrate Community Jeff Cordell, Jason Toft, Kerry Accola (UW)
- ✓ Fish Community and Occurrence (NOAA) Regan McNatt, Susan Hinton, Jeff Grote, Paul Chittaro, Dan Lomax
- ✓ Critical Field, Lab Support, UAV pilot April Silva, Narayan Elasmar (CREST)



Action Effectiveness Monitoring Research Program

- AEMR = Selected sites (Level 2) receive Full Habitat surveys Pre, 1, 3, 5 and 10 yrs. post-restoration Methods <u>here</u> All sites (Level 3) receive Basic Hydrology and Sediment Accretion Monitoring Years 1-5, 10 yrs. post-restoration
- ✓ Habitat Structure, Hydrology, Soils, Sediment Accretion Sarah Kidd, Sneha Rao, Ian Edgar (LCEP)
- ✓ Spot Check of Macroinvertebrate Community Jeff Cordell, Jason Toft, Kerry Accola (UW)
- Spot Checks at Year 5 and 10 Post Fish Community and Occurrence (NOAA) Regan McNatt, Susan Hinton, Jeff
 Grote, Paul Chittaro, Dan Lomax
- Critical Field, Lab Support, UAV pilot April Silva, Narayan Elasmar (CREST)







Need for a proper Data Management System



PNNL-22405

The Oncor Geodatabase for the **Columbia Estuary Ecosystem Restoration Program: Annual**

November 2013



71+ Sites across the lower Columbia



Level 2 AEMR Data

Other

Vegetation and Soil • 50,000+ datapoints

110

Macros, Fish, Biomass, drone, etc.

Software Options and Considerations





MS Access, SQL, ArcPro,

ArcCatalog - etc.



R, Python, MATLAB, SASS, Exploratory, etc.



Tableau

- Data Limits What data limits are imposed (such as Excel's row limits)
- **Database Capacity** Does it provide a structure for storing and connecting data?
- Accessibility and Ease of Use How hard is it for someone to use?
- QA/QC, Analysis, Visualization Capacity Can you edit/analyze/graph your data?
- Mapping and Geospatial Analysis Can you make maps and geolocate your data?
- Collaboration Easy to share with others? (Proprietary data formats? Software requirements?)
- Online/Desktop Data Sharing How easy is it to access and present data online data hosting?
- Costs How expensive is the software? Does everyone need to purchase the software to collaborate?

Software Considerations



Excel

Data Limits, Challenges with Time Series Data



MS Access, SQL, ArcPro, ArcCatalog - etc.



R, Python, MATLAB, SASS, Exploratory, etc.



Software Considerations



Data Limits, Challenges with Time Series Data

Excel

MS Access – Can hold data, but not flexible or user friendly

Arc Products – The program is best saved for specific geospatial

MS Access, SQL, ArcPro, Analyses ArcCatalog - etc.



R, Python, MATLAB, SASS, Exploratory, etc.



WAITINGLOR ARCMAP TO OPEN

C

MS ACCESS IS A "DATABASE"

OK, SO LET'S SAY THAT

It's been 84 years... NOT SURE IF ARCMAP IS LOADING



SOFTWARE CONSIDERATIONS

Excel

Data Limits, Challenges with Time Series Data

MS Access – Can hold data, but not flexible or user friendly

Arc Products – The program is best saved for specific geospatial

MS Access, SQL, ArcPro, Analyses ArcCatalog - etc.

Coding isn't for everyone

R, Python, MATLAB, SASS, Exploratory, etc.

THE CORRECT R CODE

THE MOMENT WHEN YOU FIGURE

OUT





Oregon Health Authority (OHA)
Tableau Dashboard

►<u>https://public.tableau.com/app/</u> profile/oregon.health.authority.covi d.19#%21/

¥ 6

Oregon Health Authority COVID-19

Oregon Health Authority | Salem, Oregon, United States

On March 8, 2020, Gov. Kate Brown declared a state of emergency to address the spread of COVID-19 in Oregon. The Oregon Health Authority (OHA) serves as the lead agency for the public health response.



Vizzes 30 Favorites 0 Following 0 Followers 533



Oregon's COVID-19 Data Dashboards - Table of Contents Oregon COVID-19 Update Oregon Health Authority COVID-19

Oregon COVID-19 Hospital Capacity Oregon COVID-19 Hospital Capacity Summary Tables

Tableau: Software Options and Considerations

✓ No data limits

- Use databases across multiple projects; no information repeating required
- No required coding knowledge/ Low barrier for entry
- Easy Data Visualization and Analysis Can import/use R and Python code and pivot inside Tableau
- Includes Geospatial Data Management, Mapping and Analysis
- ✓ Easy collaboration and dissemination of results
- No Application Required (can be used via web browser)
- Cost: Varies but can be FREE for most collaborative needs





Read More – Here https://intellipaat.com/blog/what-is-tableau/

Examples of Tableau Utility

Data management

Initial QA/QC

Q

Exploration and Analysis



Dissemination of results

The following slides 15-34 will be viewed/showed using our interactive online Tableau Dashboard



CEERP - BPA Database Development, Data Curation, and Analyses Conducted by LCEP – Dr. Sarah Kidd, Ian Edgar, and Sneha Rao

Please contact us if you have questions or would like access to data-skidd@estuarypartnership.org, iedgar@estuarypartnership.org, and snehar@estuarypartnership.org



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Introduction	Tableau Overview	Sediment Accretion Overview	QA/QC Processing - Flagging Questionable Data	Site Focus - Bench Height QAQC	Site Focus - Accretion (cm) by Site	Net Accretion (cm) by Marsh location, Site, and Restoration Year	Sea Level Rise - By Reach	Hydrology Overview	Hydrology Logger Locations	Salmonid Habitat Opportunity Overview	S al
Tableau Dat	ta Managemei	nt and Overvi	ew	_						:)	
					The image at We have ~6-7	the bottom of the screen of million hydrology datapoi	describes the method we ints stored in ~40 flat tex	've used to link and map (our databases together. toring lead for the site. W	e stack and combine the	m
		LL Dat	ta management		all within Tab The Site Meta We can also in	leau. Data table allows us to joi mport many other file type	n the hydrology data witl es into Tableau including	h all other datasets we ha Excel pages, GIS Shapefile	ve (including soil, biomas s, Orthomosaics, etc.	s, veg, etc.)	
Tablec	ıu Utility	🗸 Initi	al QA/QC		Overview of The next page Level Rise.	Tableau Portion of tal s cover the sediment Stak	k: e QA/QC Process followe	d by the exploration and	initial analyses for Sedim	ent Accretion and Sea	
		Q Exp	loration and Analy	ysis	Next, we'll co After, we'll co	ver the barebones of the h ver some of the next steps	iydrology dataset and sho s we plan to do and show	owcase a basic habitat op rcase some initial drone w	portunity analysis. vork.		
		Diss	emination of resul	ts	Lastly, we'll d	iscuss the ease of sharing e	everything with MCNA, Si	teigerwald, and other site	s and projects.		





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			Data			and Restoration Year					22

Project Inventory Site Map Sponsors -- All



This map shows all the sites where Sediment Accretion and Erosion Monitoring has occurred between 2012-2022. These sites are currently colored by the group (Project Sponsor or Partner) who is responsible for the AEMR Level 3 data collection. You can also mouse over the site and see the other project metadata we have on file. ...



Click the image to the right to expand it to view all background information for Sediment Stakes.





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Table Bench Height (cm) Raw Data For QAQC - All

Sed Stake	Date (Union)	Survey	Marsh Loca	Plant Com	Data Accep	Ground Elevation	0	10	20	30	40	50	60	70	80	90	100
WHC-1	08/17/2008	PNNL	High Marsh	PHAR	Y	2.4	78.9	78.0	81.3	79.6	81.0	79.1	80.7	78.0	80.9	78.3	
	07/22/2009	PNNL	High Marsh	PHAR	Y	2.4	81.9	81.1	80.0	81.4	83.0	81.1	79.6	79.7	79.8	80.2	
	07/13/2010	PNNL	High Marsh	PHAR	Y	2.4	80.0	79.7	78.7	80.4	80.9	80.2	79.1	80.1	79.5	78.9	
	08/02/2011	PNNL	High Marsh	PHAR	Y	2.4	78.1	80.0	80.2	81.1	81.0	80.9	79.8	77.7	78.9	79.5	
	07/31/2012	PNNL	High Marsh	PHAR	Y	2.4	77.4	79.2	79.1	79.8	79.1	79.6	79,2	78.6	78.6	78.4	
	07/22/2013	PNNL	High Marsh	PHAR	Y	2.4	77.4	77.4	79.0	79.9	79.4	80.2	79.3	78.6	76.3	78.5	
	02/04/2014	PNNL	High Marsh	PHAR	Y	2.4	77.7	78.6	78.4	78.3	76.7	79.3	77.9	78.0	76,9	77.6	
	07/31/2014	PNNL	High Marsh	PHAR	Y	2.4	78.0	79.2	78.8	77.8	76.1	77.2	77.5	78.1	77.3	77.9	



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DRAFT ANALYSIS - PENDING FURTHER QA/QC



Net Accretion/Erosion By Years Post Restoration by Marsh Location

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Sediment Accretion Overview	QA/QC Processing - Flagging Questionable Data	Site Focus - Bench Height QAQC	Site Focus - Accretion (cm) by Site	Net Accretion (cm) by Marsh location, Site, and Restoration Year	Sea Level Rise - By Reach	Hydrology Overview	Hydrology Logger Locations	Salmonid Habitat Opportunity Overview	Salmonid Habitat Opportunity Analysis	Wallooskee Drone Work	

DRAFT ANALYSIS - PENDING FURTHER QA/QC



SLR Scenario ✓ 0.5 m SLR Scenario (50 yrs) 1 m SLR Scenario (75 yrs) ✓ 1.5 m SLR Scenario (100 yrs)



Understanding how our tidal wetlands and floodplains are keeping track with Sea Level Rise (SLR) is critical for considering how future restoration and management actions can address further potential wetland loss. For this preliminary analysis, we have used the USACE's 2020 Lower Columbia River Adaptive Hydraulics (AdH) Model Scenarios (Link to USACE model report here: https://erdc-library.erdc.dren.mil/jspui/bitstream/11681/36295/1/ERDC-CHL%20TR-20-6.pdf).

These Scenarios (50, 75, and 100 yr) are slightly more aggressive (greater rates of change) than the Miller et al. 2018 model (https://wacoastalnetwork.com/research-and-tools/slr-visualization/) which focuses on the Oregon and Washington Coast. However, they do provide a glimpse into how well our reference and restoration sites may be keeping up with increases in Water Surface Elevation across each reach of the Lower Columbia. Further refinement of this analysis is forth coming.

Preliminary findings suggest reaches D-G may not be accreting enough sediment to keep on track with SLR and will suffer wetland loss due to drowning (in the next 50-100 yrs). These data support the need for further monitoring in these reaches to provide more data on these accretion and erosion conditions across the different wetland types.

For more analysis of SLR impacts to wetland across the LCR using the same model scenarios see our online report here: https://lcep.maps.arcgis.com/apps/webappviewer/index.html?id=90de906767444d3b97cebf7491c1d74d



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Overview Site Map -- Hydrology sites



This map shows each site monitored for hydrology.

Mouse over the site to view additional metadata for the site.

There are more than 6 million total datapoints within the hydrology database.

View the monitoring protocols for processing loggers by clicking the image below.

Progress to the next page to view hydrographs of each site and logger.



Best Practices - A Quick Guide to Water Surface Elevation and **Temperature Data Collection**

Prepared by Sarah Kidd, Matthew Schwartz, and Grace Brennan Lower Columbia Estuary Partnership October 2018



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WSE and Tempurature -- Daggett Point & Wallooskee-Youngs

Overview Site Map -- Hydrology sites





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Tableau Data Management and Overview







Habitat Opportunity -- Click the image to the right for a full explanation of these metrics

Habitat Opportunity adapted from Bottom et al. 2011 – Estuarine Habitat and Juvenile Salmon: Current and Historical Linkages in the Lower Columbia River and Estuary



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DRAFT ANALYSIS - PENDING FURTHER QA/QC



Habitat Opportunity -- Daggett Point & Wallooskee-Youngs Construction: All

Years represented: All



Utilize the map to view different sites. Use ctrl+click to select multiple sites

Habitat Opportunity parameters were adapted from appendix E of the SM2 Report (Johnson et al., 2018). Fish require 0.5m of depth above any barriers to access the site with less then 0.5m of depth inaccessible to fish passage. Optimal conditions also include a tempurature of less than 17.5C. Marginal conditions are where the tempurature is greater than 17.5C but less than 22C. If the tempurature os greater than 22C, it is inhospitable to salmonoids (Kidd and Schwartz, 2018).

In the coming months, we will extend this analysis across the site utilizing drone data and GIS modeling to determine overall habitat opportunity and overall percent accessible for each site in the lower Columbia River.



Site Type Reference

Years ΔII



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Wallooskee Initial Drone implementation

This is an initial implementation of Wallooskee drone imagry. The metadata associated with this raster will allow us to conduct full habitat opportunity analyses and classify vegetation sections.

There is a resolution of $\sim\!5 \text{cm}$ within the ucompressed, original images.

Further, this will allow us to have high quality basemaps for each site.

In the coming months, we will be adding each site's drone imagry into Tableau and performing analyses using both ArcGIS and Tableau.

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Overview Map of MCNA Water Quality Monitoring Locations. Data from these locations were combined to produce the Main North and Main South groupings featured throughout this interactive workbook. Toggle the Data Groups to see all monitoring locations and the locations of Beaver Dams across the site.

Throughout these analyses, Columbia River data has been taken from the St. Helens Gage (water surface elevation) and the CMOP Saturn 5 monitoring Station (dissolved oxygen and temperature). Willamette River data has been taken from the Portland USGS monitoring Station (dissolved oxygen, temperature, and depth). MCNA 2016 data were collected by NOAA and all other data (2017-2021) were collected on-site by LCEP.

View the full MCNA Story here: https://pub-lic.tableau.com/views/OverviewofMultnomahChannelMarsh-NaturalAreaMCNAWaterQualityData2016-2021/MCNAAnal-ysisOverview?:language=en-US&:display_count=n&:ori-gin=viz_share_link...

Data Groups

Multnomah Channel

South Main

Data Groups Beaver Dam Columbia River Crabapple Wultnomah Channel North (Other) North Main South (Other) South Main Willamette River

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Steigerwald Monitoring Overview Map - Water Surface Elevation & Temperature

Duration of Monitoring Data (currently available)

This map highlights the locations of our water surface elevation and temp data loggers as of August 2021. All of these locations are currently collecting data. Gibbons loggers have data gaps due to logger losses. The Gibbons Evergreen logger has been lost multiple times resulting in no data for this location as of August 2021. This workbook also includes rainfall and air temperature data pulled from the PRISM database.

View the full Steigerwald Analysis here: <u>https://public.tableau.com/views/SteigerwaldMonitor-ingDec2021update/SteigerwaldWaterQualityDataQuickLookMarch2021?:language=en-US&:display_count=n&:origin=viz_share_link</u>

Next Steps

Integrate and utilize these data to answer critical uncertainties at the site level and across the lower River

- > AEMR/EMP Starting Points:
- ✓ Compile, QA/QC, Explore All (Level 2/3 & EMP)
 - I. Sediment Accretion/Erosion Data
 - II. Hydrology Data
- ✓ Create Interactive Data Dashboards Reporting out for the AEMR sites surveyed in 2020 and 2021
 - Include all data collected analyzed with meaningful metrics

 \checkmark Seek feedback and continue to evolve our analysis and reporting

Drone Inclusion

Orthomosaic basemap for each site using Mapbox

Full site wide statistics and analysis based on drone data

Full EMP data synthesis analysis

Macros, Fish, and Biomass

Full synthesis analyses of all sites

Focus on habitat opportunity and impacts of specific restoration actions

Transition all LCEP datasets into Tableau

Look at Examples Online

- Our Tableau Public Page (With examples no login required): <u>https://public.tableau.com/app/profile/sarah.ann.kidd</u>
- Login into our Tableau Online to See Today's Examples (we'll keep this live for a few days):
 - Website: <u>https://sso.online.tableau.com/public/idp/SSO</u>
 - Login: <u>monitoring@estuarypartnership.org</u>
 - Password: EPMonitoring12!?
- Watch this presentation: <u>https://youtu.be/ExDxspBfsJo</u>

- Contact us if you are having any issues or questions:
- Sarah Kidd <u>skidd@estuarypartnership.org</u>
- Ian Edgar <u>ledgar@estuarypartnership.org</u>

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